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MISCONCEPTIONS IN GEOGRAPHY HELD BY HIGH SCHOOL SENIORS

Submitted By

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CHAPTER I

STATEMENT OF THE PROBLEM AND IMPORTANCE OF THE STUDY

The purpose of this thesis is to show the extent to which certain misconceptions in geography exist among high school seniors.

The writer's interest in this subject was aroused as a result of reading of the concern over the inadequacy of geographic knowledge possessed by our citizens and potential citizens evidenced in newspapers, popular magazines,[1] and educational periodicals.[2] The authors declare, in these periodicals, that we as a nation are geographically illiterate. "Dr. John W. Studebaker, United States Commissioner of Education, went so far as to say in March 1942: 'Apart from rather backward nations we are more illiterate geographically than any other nation I know'".[3] They declare that too many people, misunderstanding geography and looking on it as a simple subject, claim

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1. "Geography Needs a Brush-up Too", Saturday Evening Post, 216:104, April 1944; Thurber, J., "1776 and all that; Suggestions for Remedying Educational Situations Exposed by the Times", New Yorker, 19:15-17, April 24, 1943.

2. Kohn, C. F., "Thinking Geographically", Social Education, 9:252-4, October 1945; Renner, George T., "What the World Has Taught Us About Geography", Journal of Geography, 43:321-30, December 1944; Ott, George W., "High Schools Need More Geography", California Journal of Secondary Education, 20:410-13, November 1945.

3. Stiles, B., "Why Not Teach Geography?", Harper's, 186:626-32, May 1943.

to already know it all, whereas the average adult knows little. "Geography, like cooking, love, and other basic subjects, is more complicated than most people think. Although the war increased popular interest in it, the general average of geographic knowledge remains at about the level of the seventh grade."[1] These writers are quick to throw the blame for the low level of geographic intelligence on the schools. The schools have not required enough geography. "American ignorance of geography is primarily the fault of the public school system. Geography in this country has been almost universally considered an elementary school subject. It is fairly well taught in the grades, hardly touched in the high schools."[2] They believe that more geography should be taught in the high schools; that to neglect it there is the height of folly. "In a world made constantly narrower by mechanical progress, geographical illiteracy is a species of blindness. Certainly those of us today who lack some basic familiarity with continents, oceans, distances, climates, mountain chains, deserts, jungle lands, sea routes, air routes, etc. must grope through current events like men with blurred sight."[3] According to the literature, "the fate of

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1. Coughlan, Robert, "Isaiah Bowman, the World's Leading Political Geographer Now Has a New Set of Boundary Worries", Life, 19:118-20, October 22, 1945.

2. The Teaching of Geography, Thirty-Second Yearbook of the National Society for the Study of Education, Public School Publishing Company, Bloomington, Illinois, 1933, p. 168.

3. Stiles, "Why Not Teach Geography?", p. 626.

civilization today depends quite largely upon an adequate program of geographical education. And the task is definitely the responsibility of the schools and colleges."[1]

Studies have been cited by the advocates of more geography to show that the schools and colleges have not given an adequate training in geographical concepts. The results of testing sixteen hundred Air Corps Cadets (practically all of them high school graduates) from every state in the United States except Maine, New Hampshire, and Vermont, revealed a lack of knowledge of even simple geographical concepts, we read.[2] Less than half knew the location of the equator, Tropic of Cancer, Tropic of Capricorn; less than half could distinguish between parallels and meridians or recognize the major continents, oceans, and archipelagos.

The opportunities for geographic training being offered in the high schools, the writers find, are insufficient. Geography is not included among the most common courses offered in the social studies throughout the nation.[3] The report of the

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1. Pickelsimer, Parnell W., "Lesson in Geography", Journal of Geography, 45:29-34, January 1946. See also: Atwood Wallace, "The New Meaning of Geography in World Education", Journal of Geography, 46:11, January 1947. (Science has given man power to destroy civilization. People must come to have an intelligent respect and sympathy for each other.)

2. Schwendeman, J. R., "Some Experiences in Teaching Sixteen Hundred Cadets of the United States Army Air Force" (345th College Training Detachment), Journal of Geography, 44:152-161, April 1945.

3. Wesley, Edgar Bruce, Teaching the Social Studies, D. C. Heath and Company, Boston, 1942, pp. 45-57.

Committee on American History in Schools and Colleges affords little cheer in its recommendation for continuing the study of geography "in the same grades where it has been taught for a long time, and in the upper grades in correlation with history and other social studies."[1] Some writers, trying to make the best of a bad situation, agree with the Committee that introducing geography as a separate subject required for all in the high school is impractical, that schools do not have the time nor teachers the energy for any additional courses. Others refuse to compromise. They point out that in the past geography has always been the loser when taught in so-called social studies courses. "Most of the junior high school courses in the social studies seem to place much more stress on history and civics than on geography. The senior high school material is almost exclusively history and civics."[2] Hence they insist that a one year, two year, or four year geography course be taught in the high school.[3]

The present writer does not intend to detract from these arguments for more geography. Perhaps it would be desirable to have more geography taught in the future. But, for the present,

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1. Report of the Committee on American History in Schools and Colleges, Macmillan, Boston, 1944, p. 11.

2. The Teaching of Geography, 32nd Yearbook, p. 566.

3. Ott, George, "High Schools Need More Geography", pp. 410-13, (a recommendation for a two year course). See also: Cutshall, Alden, "Worthwhile High School Geography", Journal of Geography, 43:223-8, September 1944, (a recommendation for a four year course).

might it not be wiser to emphasize better geography teaching rather than more of it?[1] This question prompted the writer to undertake the present study. The results should serve to indicate whether widespread misconceptions exist in geography, or whether the geography taught has been, on the whole, well taught. A closer analysis of the results should reveal a few particular misunderstandings possessed by certain groups.

It is important that the teachers know what, and to what extent, misconceptions exist in order that they may use their teaching time efficiently - dispelling misconceptions expeditiously, or guiding the pupils in the accuisition of additional knowledge.

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1. Many in the past have argued for better geography teaching. See: Sutherland, William J., The Teaching of Geography, Scott, Foresman & Company, New York, 1909, p. 3, (Geography rich and vital in its possibilities yet method of teaching it restricts value, curtails interest). See also: Johnson, Henry, The Other Side of Main Street, Columbia University Press, New York, 1943, p. 225. (Teachers, constantly struggling to eradicate erroneous notions acquired by pupils in previous grades, wish the previous teaching had been better teaching.)

CHAPTER II

SUMMARY OF PREVIOUS RESEARCH

The general plan of this thesis is based on that in Paul Kelley's "Misconceptions About American History".[1] On the surface the two theses are similar. Historical and geographical misconceptions, however, arise from different causes. History is a subject of wide interest to all citizens, highly charged with patriotic feeling, pride for the nation or pride for the locality. Many can be found who permit favorable traditions, little matter if inaccurate, to be passed on in textbooks or by word of mouth. The same cannot be said about geography. This subject arouses little feeling. Misconceptions that arise in this subject are due to improper or inadequate teaching. Although the present writer will follow the general procedure of Kelley - more or less subjectively decide on misconceptions held, and then objectively measure the extent to which they are held - there the similarity ends.

Since approximately 1916, efforts have been made by educators toward greater objectivity in all phases of instruction.[2] Operating on the general principle that social studies instruction should increase good citizenship and that good citizenship

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1. Kelley, Paul I., "Misconceptions About American History Held By High School Seniors", Unpublished Master's Thesis, Boston University, School of Education, 1947.

2. Encyclopedia of Educational Research, Monroe, Walter S., Editor, Macmillan Company, Boston, 1941, p. 1131.

consists in effective coping with the perplexities and problems of normal living, research workers have attempted to tabulate, among other things, the minimum civic information a citizen should possess and the concepts that are basic to ordinary social thinking. These so-called "activity analyzers" have had "noticeable effect on the formulation of specific objectives and on the selection of curricular content."[1] They failed to obtain agreement as to the nature and content of useful courses. This statement applies to geography as well as to the other social studies. Isaiah Bowman wrote in 1934, "There is rather general agreement among the geographers as to the material of geography. There is disagreement as to how the material should be handled for educational purposes."[2] The failure of the "activity analyzers" was perhaps inevitable. "The objectives of social studies instruction cannot be determined by research. They are expressions of judgment as to values and so emerge from philosophy rather than research."[3] The analyzers succeeded, however, in particularizing the objectives, in reducing the generalized

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1. Wilson, Howard E., and Murra, Wilbur F., "Contributions of Research to Special Methods: The Social Studies", in The Scientific Movement in Education, Thirty-Seventh Yearbook of the National Society for the Study of Education, Public School Publishing Company, Bloomington, Illinois, 1938, p. 148.

2. Bowman, Isaiah, Geography in Relation to the Social Sciences, Part V, Report of the Commission on the Social Studies, Charles Scribner's Sons, New York, 1934, p. 69.

3. Encyclopedia of Educational Research, p. 1134.

aims into component elements.[1] They succeeded in placing the emphasis on the necessity of bringing objectives down to earth.

The evidence as to the nature of the learning process has emphasized the role of the teacher as a "director of learning rather than an imparter of information."[2] The evidence has indicated the final goal of all education is correct conduct. Correct behavior is the best measure of teaching success.[3] The specific goals along the way have not been identified. But "activity analyzers" have served a useful purpose in directing attention to this problem. Those workers who investigated the problem of selecting or rejecting the content of various courses probably have brought about more actual changes. They studied the content with regard to the following criteria: pupil needs, learnability, accuracy, and utility. Studies with regard to the first three criteria proved to be of no immediate help. Studies showed that pupil needs vary,[4] that learnability is relative,[5] and that accuracy of content is increasing.[6] When they analyzed

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1. Wilson and Murra, "Contributions of Research", pp. 149-50.
2. Encyclopedia of Educational Research, p. 1139.
3. Ibid., p. 1135.
4. Hanna, Lavona, "The Extent of Individual Differences" in Adapting Instruction in the Social Studies to Individual Differences, FIFTEENTH YEARBOOK OF THE NATIONAL COUNCIL OF THE SOCIAL STUDIES, 1944, pp. 6-16.
5. Johnson, Henry, The Teaching of History, Macmillan Company, 1940, pp. 103-4.
6. Ibid., p. 249.

the content with respect to utility, they made their greatest contributions.[1] Specific content that was found of little utility is in the process of being eliminated from all progressive schools. The present writer, keeping this research in mind, has endeavored to limit his study to the geographical content which, if correctly understood, is useful. Like the work of the "activity analyzers", this work will be more "provocative than positive".[2] No thorough search will be made seeking reasons for misunderstandings acquired. Their existence alone will be set forth. The evaluation or revaluation of the quality of guidance in geography given to pupils of any school in the past is left to the individual teacher.

It would be unwise to formulate a list of facts misunderstood in geography without first considering research in the field of objectives. To draw up a long list of little known geographical items would be extremely easy. That is definitely not the purpose of the present paper. The items to be considered are those that are in line with modern objectives. Therefore it seems necessary to review briefly the status of

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1. See: Rugg, Harold and Hockett, John, Objective Studies in Map Location, Lincoln School of Teacher's College, New York, 1925. See also composite word lists for separate fields compiled by Stephenson, Eubanks, Ware, Pressey, and others in the appendix to: Kelley, Truman, and Krey, A. C., Tests and Measurements in the Social Sciences, Charles Scribner's Sons, New York, 1934.

2. Wilson and Murra, "Contributions of Research", p. 150.

objectives in geography teaching.[1]

In the nineteenth century the geography taught was "sailor geography".[2] Pupils were taken on a sight-seeing tour of the world, stopping here and there to read descriptions of various places. Such a study was thought to have great disciplinary value. As late as 1910 the foremost objectives of geography teaching were "(1) to develop mental techniques; (2) to develop techniques for study."[3] Now that the theory of mental discipline is thoroughly discredited, "sailor geography" receives much less attention. Place location is no longer considered one of the most important objectives."[4] The emphasis has shifted

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1. In the interest of brevity review is limited to those objectives pertinent to this study. For an extended listing of objectives classified in three major divisions, understandings, attitudes, skills, see: "Preliminary Report of the Curriculum Committee of the National Council of Geography Teachers", Journal of Geography, 44:51-79, February 1945.

2. Geography as a subject is old. See: Johnson, Teaching of History, pp. 230-1. Only modern objectives, however, are related to this thesis.

3. Johnson, Terrell, "Changing Objectives in Geography", in Classroom and Administrative Problems in the Teaching of the Social Sciences, Second Yearbook of the National Council for the Social Studies, McKinley Publishing Company, Philadelphia, 1932, p. 179.

4. Ibid., p. 179.

"from memory to thought as the principal purpose."[1] "The chief aim in geography teaching is not information but ability to think geographically. The outstanding educational objective in geography, in other words, is to help make purposeful thinkers and successful doers, not to create animated gazeteers."[2] The primary objective of the progressive teacher is to see that pupils acquire, in addition to a few transient facts, the ability to "think geographically."[3] This ability is not susceptible of exact definition. Authorities agree that before anyone may "think geographically", he must be able to handle correctly "the basic tools of geographic instruction" - maps.[4] He must possess

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1. Crawford, Claude C. and McDonald, Lois R., Modern Methods in Teaching Geography, Houghton Mifflin Company, Boston, 1929, p. 1. This statement must be qualified - many schools professing latest objectives give lip service only. See: Mahoney, John H., For Us the Living, Harper and Brothers, New York, 1945, p. 40. (Social studies are still loaded with information much of which is there because it is there.) See also: Kelley and Krey, Tests and Measurements in the Social Sciences, pp. 236, 293. (Authors state there is still much emphasis on mere fact memorization.)

2. Barrows, N. H., "Some Critical Problems in Teaching Elementary Geography", Journal of Geography, 30:276, December 1931.

3. This is one aspect of intelligent thinking - "the ability to view a problem intelligently from all important angles", Teaching of Geography, 32nd Yearbook N.S.S.E., p. 106.

4. James, Preston C., "Differences From Place to Place", Journal of Geography, 45:279-85, October 1946. See also: James, Preston, "Developments in the Field of Geography and their Implications for the Geography Curriculum", Journal of Geography, 46:221-6, September 1947. (Author states that without the ability to understand symbols on maps no comprehension of geography is possible.)

"the ability to locate and use various geographic materials when (he) has a need for such material."[1] There is a divergence of opinion, however, as to what additional basic concepts the "geographical thinker" must have. A few authorities, conforming with the report of the National Society for the Study of Education in 1933, list as the major concepts the following: (1) an understanding of "the interrelationships existing between man and the natural environment in specific regions", (2) an understanding of the nature and world distribution of given kinds of human activities, (3) an understanding of the various ways in which different people cope with specific types of natural factors such as climate, topography, and the like.[2] Other authorities, admitting previously mentioned concepts as not entirely irrelevant, have their own lists. Following are a few of the understandings they consider prerequisite to "geographic thinking":[3] (1) an understanding of the earth-sun relationships,[4] (2) a sympathetic understanding of the problems

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1. Johnson, T., "Changing Objectives in Geography", 2nd Yearbook N.S.S.E., p. 180.

2. The Teaching of Geography, 32nd Yearbook N.S.S.E., pp. 201-2.

3. No attempt is made to list them in any particular order.

4. Lemaire, M. E., "Universal Subject - Geography - for the Secondary School", School Science and Mathematics, 46:335-8, April 1946.

of other peoples,[1] (3) an appreciation of the need of conservation of our natural resources,[2] (4) an understanding of the "world situation created by the world-wide airways",[3] (5) a realization that "the more complex the culture, the greater the variety of connections with the earth resources and the more indirect they become",[4] (6) an understanding that "the significance of the features of the physical earth is determined by man and not by nature",[5] (7) an awareness that "the physical and human differences which exist from place to place on the earth are significant to us because the great economic, social, and political issues of our time are in part the result of these differences",[6] (8) an awareness of the significance of relative location of earth conditions with reference to other places on the earth.[7]

The discussion thus far gives the setting for the present study. There is much additional research which all who are

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1. Johnson, T., "Changing Objectives in Geography", 2nd Yearbook N.S.S.E., p. 180.
2. Ibid., p. 180.
3. Gregory, W. M., "School Geography and our Foreign Policy", School and Society, 58:474-6, December 18, 1943.
4. James, Preston, "Developments in the Field of Geography and their Implications for the Geography Curriculum", p. 222.
5. Ibid., p. 223.
6. Ibid., p. 223.
7. Kohn, C. F., "Thinking Geographically", p. 252.

interested in improving geography teaching should know of. Following, for example, are some of the findings of research summarized in the Encyclopedia of Educational Research:[1]

"1. Children make numerous errors in trying to read maps.
2. The reading of maps must be taught specifically and concretely.
3. Pupils can be taught to read maps with a fair degree of accuracy.
4. Without guidance pupils do not know whether the word or the dot indicates the location of a city on the map.
5. The use of a scale of miles, the directions, the reading of latitudes and longitudes, the direction of river flow, and the key symbols for locating a place on the map require specific instruction.
6. The use of an outline map is an effective aid to learning.
7. Real maps and hypothetical maps all have teaching value.
8. Children do not acquire a knowledge of directions until they study geography.
9. Such items as zone, latitude, and longitude require specific training.
10. Numerous studies prove that ignorance of common geographical facts is widespread.
11. All geographical errors common to pupils are also common among teachers.
12. The incidental teaching of geographic tools is a failure."

Since the writer was unable to locate any similar study dealing with geographical misunderstandings possessed by high school students, he turned to investigations of geographical misunderstandings conducted among students in the grades for clues as to probable misconceptions existing in the high school

Lord[1] studied the ability of seventh grade children to make

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1. Encyclopedia of Educational Research, p. 1149.

2. Lord, F. E., "The Ability to Make Geographical Uses of the Ideas of Longitude and Latitude", Unpublished Master's Thesis, University of Chicago, 1928, reported in Teaching of Geography, 32nd Yearbook, pages 466-8.

geographical use of the ideas of latitude and longitude. The problem as related to longitude was limited to a study of the children's ability to interpret the activities that involve an understanding of the relation between longitude and time. As related to latitude the problem was limited to a study of the pupils' ability to understand the relationship between "(1) latitude and seasons (summer and winter), (2) latitude and length of day, (3) latitude and length of growing season, and (4) latitude and the position of the noon sun." Survey tests were given to determine the understandings children had. The results of this study indicated that:

> "The children were relatively accurate in making use of the geographical uses of the idea of latitude in interpreting activities which relate to (a) the summer season of places in the North Temperate Zone, (b) the winter season of places in the North Temperate Zone, (c) the winter season of places in the North Frigid Zone, (d) long growing seasons in regions of low latitudes, and (e) short growing seasons in regions of high latitude."[1]

Moreover, and this is of particular value to the present study, results indicated that:

> "There are conspicuous deficiencies in ability (1) to explain the relation between man's activities and position of noon sun in the sky, and (2) to explain activities involving conditions that are the reverse of those experienced by children who live in a northern region..... It also seems clear that children are influenced more strongly by concrete, actual experiences relating somewhat to the idea of latitude than they are by experiences (of whatever type they may be) that have been met in formal geography study.....The children tend to apply to all other parts of the world these ideas gained from actual experience. Furthermore, any experiences which they may have had that tend to overcome the results of such

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1. Ibid., p. 467-73.

generalization from insufficient data on their part have been mostly ineffective."[1]

Isabelle K. Hart collected all the geography errors that she had ever noted plus all the errors reported by cooperating superintendents and supervisors.[2] She organized these errors into groups. Then she submitted her classifications of errors to fifty-two experienced supervisors of geography classes. Each one of them noted whether he had observed the error. Following is a complete listing of her classifications of errors. The numbers (in parentheses) indicate how many of the fifty-two authorities reported common observation of each error.

"Group I

"Errors traceable to vocabulary difficulties or lack of association of words with correct mental concept.

A. When concrete visual images could be obtained by use of pictures, specimens, or available landscape features.

1. Belief that the difference between a mountain and a hill is a matter of height. (52)
2. Belief that a plain is generally as flat as a floor. (50)
3. Inadequate concept of valley, hill, gorge, peninsula, island, and other land forms and corresponding water bodies. (33)
4. Confusion of mountain peak with mountain range. (30)
5. Belief that a plateau is practically as level as a table top. (29)
6. Confusion of glacier and avalanche. (19)
7. Confusion of tundra with icecap. (12)
8. Confusion of iceberg with floe ice. (11)

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1. Lord, "The Ability to Make Geographical Uses of the Ideas of Longitude and Latitude".

2. Hart, Isabelle K., "A Classification of Errors in Geography Made by Teachers and Pupils", Teaching of Geography, 32nd Yearbook, pp. 479-82.

B. When the concrete visual images could be obtained by use of models or demonstrations.
   1. Confusion of mouth and source of rivers. (50)
   2. Ignorance of downstream and upstream direction of rivers. (41)
   3. Confusion of drainage basin with river system. (41)
   4. Wrong idea of relations of sun's rays to earth, not realizing that the sun's rays are all parallel to each other and that the so-called slanting rays owe their name to the curve, or 'slant', of the earth's surface. (37)
   5. Inability to visualize significance of up and down on the earth's surface. (33)
   6. Thinking that branch of a river flows away from the main stream. (13)

C. When the words are quite abstract or not readily illustrated by visual aids.
   1. Very incomplete concept of climate, often thinking that it is synonymous with temperature alone or thinking that it can be adequately described by 'good' or 'bad'. (42)
   2. Confusion of product with resources, industry, or occupation. (38)
   3. Vague notion of 'ocean current', but exaggerated idea of usefulness of ocean current as a climatic factor. (38)
   4. Confusion of cyclone with tornado. (32)
   5. Lack of concept for equinox and solstice. (29)

"Group II

"Errors due to lack of association of symbol with correct mental concept.

   1. Confusion of north with up, south with down. (45)
   2. Confusion of country with continent. (38)
   3. Inability to read either latitude or longitude, or to tell which is which. (37)
   4. Confusion of state with country. (35)
   5. Belief that the Arctic and Antarctic circles are limits of belts of perpetual cold weather, instead of markers of twenty-four hour (or longer) continuous daylight or darkness. (35)
   6. Belief that the 'zones' are perceptibly divided by differences in climate. (34)
   7. Confusion of symbol with real thing: 'this dot is St. Louis,' rather than 'this dot represents St. Louis', or 'shows where it is'. (34)
   8. Belief that the Tropics of Cancer and Capricorn are the limits of the belt of year-round hot weather, instead of the turning points of the vertical ray. (30)

9. Belief that the land always slopes up toward the north, and that no river can flow northward. (30)
10. Confusion of parallel with latitude. (29)
11. Confusion of meridian with longitude. (27)
12. Lack of distinction between symbols for political boundaries and streams. (21)

"Group III

"Errors based on lack of skills and abilities.

1. Inability to distinguish head or foot of a lake, inlet or outlet of a lake, source or mouth of a river. (37)
2. Inability to trace river upstream or downstream. (34)
3. Hunting for places on maps instead of memorizing location and pointing to the places promptly. (38)
4. Inability to interpret distance north or south by means of changing number of degrees of latitude to approximate number of miles. (32)
5. Inability to distinguish actual direction (cardinal and semi-cardinal points) in space. (31)
6. Inability to interpret direction symbols on map or globe. (29)
7. Inability to tell from map symbols in what part of continent a country is located or in what part of a country a city is located. (28)
8. Errors in estimating distances; thinking of the Arctic Circle as if it were close to the North Pole: 'Alaska and other lands close to the Pole.' (28)
9. Inability to tell from map symbols what direction one city or country is from another. (27)
10. Confusing name of a city, or its first or last letter, with the dot which is the true symbol. (25)
11. Inability to interpret map or globe scale. (23)
12. Inability to refer to map key or legend for explanation. (19)
13. Inability to interpret map or globe colors. (18)

"Group IV

"Errors based on half-truths and misconceptions gathered from unconsidered remarks of teachers and others.

1. Thinking that it never rains in a desert. (47)
2. Thinking that farther and farther south, the climate is warmer and warmer. (39)
3. Considering Alaska (all of it) as the Far North, and believing that Alaska is so cold the year round that no life or vegetation exists 'bare

cold stretches of ice and snow without life.' (36)

4. Confusing a city with the surrounding rural area; e.g. Rochester produces quantities of peaches. (34)
5. Thinking that the boundaries of the torrid zone enclose all the hottest places; similarly, that the frigid zone contains all the coldest places. (33)
6. Thinking that our hot weather is caused by the nearness of the sun to the earth. (30)
7. Thinking that the sun is overhead every noon at the equator. (28)
8. Thinking that it is summertime in Florida when it is winter here. (25)
9. Thinking that any phase of the moon except full moon is an eclipse.

"Group V

"Errors based on wrong ideas of cause and effect.

1. The reason why it does not rain much in northern Africa is because there is a large desert in northern Africa. (30)
2. The reason our Cotton Belt has a long growing season is because cotton needs seven months to mature. (16)"[1]

Alison E. Aitchison[2] prepared an objective test on the zones. This test was given to 1100 pupils mainly in sixth, seventh, and eighth grades. Results show that pupils' thinking is influenced greatly by zone names. Pupils generally thought of the torrid zone as very hot; temperate zones as mild, frigid zones as very cold. The author concludes that, since misconceptions with regard to these zones is so widespread, it would be

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1. Teaching of Geography, 32nd Yearbook, pp. 480-82.

2. Aitchison, Alison E., "Torrid, Temperate and Frigid Zones - Sources of Error in Children's Thinking", Teaching of Geography, 32nd Yearbook, pp. 483-85.

better, perhaps, to discontinue teaching them.

Edith Parker's diagnosis of 200 errors made by fifty-eight pupils of the sixth and seventh grade is informative. She found 9% of the 200 errors due to "mistaken concepts or lack of concepts of simple features or of symbols representing them on the map";[1] 3% due to carelessness; 15% due to difficulty with such terms as distribution, density, standard of living, or difficulty in showing all the steps in a chain of thought; 37% due to earlier and premature generalizations made with inadequate understandings of required personality ideas; 38% due to earlier and premature world generalizations concerning significance of latitude, and to inadequate simple regional personality understandings.

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1. Parker, Edith P., "Investigating the Curriculum in Geography", Teaching of Geography, 32nd Yearbook, pp. 137-45.

CHAPTER III

PLAN OF THIS STUDY

The purpose of this study, to find and brand as such geographical misinformation masquerading as fact in the high school, readily suggested the plan to be followed. A questionnaire consisting of likely misconception items would be drawn up and submitted to a few hundred high school seniors.

The writer proceeded to assemble a long list of possible misconceptions in geography. Suggestions found through extensive reading of periodicals, (e.g. National Geographic and Journal of Geography) and geography books (both high school and college, texts and non-texts) furnished the nucleus for the list. Other suggestions by geography professors, teachers of geography, and colleagues in a social studies seminar greatly expanded it.

Each possible item in this list was subjected to meticulous study. Those ambiguous in any way or likely, because of inherent difficulty of concept or phraseology, to be beyond the comprehension of the average high school senior were dropped. The remaining fifty-three items were utilized, together with thirty-four true statements, in the construction of a questionnaire, which, incidentally, partook of some of the characteristics of an objective alternate response test. Pupils were asked to indicate, by placing checks in appropriate columns, whether they

agreed with or disagreed with each item. No time limit was imposed. In order to minimize the factor of guessing two devices, explained forthwith, were employed. The attention of the pupils was called to the fact that their performance would in on way affect their mark. A space was provided, to the right of each item, whereby pupils could indicate if they had doubts concerning the particular item. The purpose of the questionnaire-test was, furthermore, shrouded by including items that obviously were not test items, e.g. Boston is the hub of the universe.

One purpose of this study, though subordinate to that of finding what misconceptions exist, nevertheless an aim, was to find whether the prevalence of misconceptions is in any way related to the sex of students, their age, the number of geography courses they have had, or to the degree of interest they manifest in geography. In order to secure data bearing on this purpose, a short introductory questionnaire was constructed. Students were asked to write their names, ages, and reasons for liking or disliking geography, and to note whether a knowledge of geography had ever helped them. This short questionnaire, designated Part I, was prefixed to the questionnaire-test proper, designated Part II; and the whole was called the Geographical Questionnaire.

Over five hundred copies of this were made. These were distributed to social studies teachers in Dighton, Gloucester, Haverhill, Quincy, Somerville, and Taunton (all in Massachusetts)

who had indicated their willingness to administer the questionnaire during school hours to seniors in their classes. As quickly as possible after the questionnaires were returned, the individual items were analyzed. Results in terms of numbers of pupils making particular responses were tabulated. All items of the questionnaire having been analyzed, these numbers were converted into percentages - which served to show quickly and concisely for each item the proportion of pupils who had answered correctly, the proportion that had answered incorrectly, and the proportion that had indicated uncertainty.

The criteria to be followed in determining which misconceptions were most prevalent were arbitrarily set up. Statements actually false but judged to be true by fifty per cent or more of the pupils were termed prevalent misconceptions. The writer felt that the misconceptions believed unreservedly by over half of the seniors in high schools tested merited the special notoriety which setting them apart in a special category would bring. Nineteen such misconceptions were found.

The questionnaires were then corrected (previous to this items of Part II had been individually analyzed but papers had not been read in toto) with reference to these nineteen prevalent misconceptions. These scores, in terms of number of misconceptions held (limited to the nineteen) were used to determine if any observable relation could be detected between the number of misconceptions held and the variables previously

mentioned - pupils' sex, pupils' age, number of courses of geography to which pupils had been exposed, and pupils' interest in geography as manifested by their replies to Part I of the questionnaire.

CHAPTER IV

THE RESULTS OF THIS STUDY

This study is concerned mainly with pupil responses to specific items in so far as they indicate presence or absence of geographical misconceptions. The questionnaire employed can in no wise be treated as an achievement test. Pupil responses are particularly significant only when treated item by item. Since this is so, logic demands that the individual summaries of results be presented seriatim. The order to be followed has no special significance. Items will be treated in the order in which they appeared in the test questionnaire.[1] A summary of responses made by 510 high school seniors and a few comments will follow each item.

Summary of Responses to the Individual Items

1. Boston is the hub of the universe. ( )( )( )

48% agreed with the statement; 46% disagreed; 6% were uncertain.

This is definitely a statement of opinion. It was placed first in order to shroud the exact nature of the questionnaire. In some cases this accomplished its purpose; the students went blithely on their way checking whether they agreed or disagreed

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1. The nineteen misconception items found most prevalent will be starred (*) and underlined. A small letter a will follow the statements that are true; a small letter d will follow the statements that are false.

with each statement unaware that the items, other than this one, were statements of fact. In a few cases, being thus confronted with a statement of opinion aroused a spirit of antagonism. Nevertheless most ventured an opinion and naturally, since all the students were inhabitants of Massachusetts, Boston received a plurality.

*2. Regions of dry, rocky, wastelands are not deserts. ( )(d)( )

39% answered correctly; 57% incorrectly; 4% were uncertain.

Desert, as it is defined in the dictionary or for that matter in any geography, is: "A more or less barren tract incapable of supporting any considerable population without an artificial water supply. Rock disintegration in deserts predominates over rock decay, causing the long slopes of stony detritus extending far up the mountain sides, the undrained basins, the salt pans or playas, and the areas of shifting sands so common in deserts."[1]

The majority of seniors, however, apparently think of deserts only in connection with sand and heat. The mountains of Sahara, the cold of the Gobi Desert are relatively unknown. Seniors, thinking of stereotyped illustrations in grammar

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1. Webster's New International Dictionary of the English Language, G. & C. Merriam Co., Springfield, Mass., 1947.

school texts, are too confident they already understand all that need be known of deserts. Perhaps it would be well to devote a little time in social study classes to discuss the nature of deserts. An understanding of deserts cannot be taken for granted in the high school.

3. Spanish is spoken by more people in Madrid than in any other city. ( )(d)( )

59% answered correctly; 40% incorrectly; 15% were uncertain.

Spanish is spoken in Madrid (population 1,171,428) it is true, but Buenos Aires (population 3,677,654) is a larger city and Spanish is also spoken there.[1] The results indicate that seniors associate Spanish with Madrid. Could it be that not enough stress has been placed on Latin America in the schools?

4. Moscow is nearer to Miami, Florida than to Seattle, Washington. ( )(d)( )

60% answered correctly; 29% incorrectly; 11% were uncertain.

The air distance between Miami and Moscow (easily found on any globe) is approximately 6600 miles; the distance between Moscow and Seattle is 5700 miles.

The writer had expected that the majority, thinking in terms of lengths of land and sea routes, would say Moscow and

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1. Steinberg, S. H., Editor, Statesman's Year-Book, Macmillan Co., New York, 1947, p. 548.

Miami were closer. Results seem to indicate students are beginning to think in terms of air transportation.

5. Prevailing winds are strong winds. ( )(d)( )

50% answered correctly; 39% incorrectly; 11% were uncertain.

Prevailing winds are the average or normal winds of the region.[1]

A bare majority responded correctly. There were a few pupils, however, who were troubled by the connotations of the term prevailing.

6. The sun is more than one hundred times as large as the earth. (a)( )( )

73% answered correctly; 17% incorrectly; 10% were uncertain.

The sun's mass is 332,000 times that of the earth. Since its density is approximately one quarter that of the earth, its actual volume is over one million times as large as the earth.[2]

Results show that this fact has been relatively well taught.

This true statement, along with other true statements, was included for the purpose of balancing the questionnaire. Had all statements been false, pupils might have deduced this fact

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1. Webster's Dictionary.
2. Ibid.

early in the questionnaire and marked all following questions accordingly without giving them proper thought.

*7. A cyclone is a tornado of large extent. ( )(d)( )

34% answered correctly; 59% incorrectly; 7% were uncertain.

A tornado - originally meaning tropical thunderstorm - has been extended by popular usage to mean any violent or destructive windstorm. Still it would be wise to restrict its usage to a "whirling wind accompanied by a funnel-shaped cloud, very violent and destructive." Cyclone means simply "a wind blowing circularly." In the case of extra-tropical cyclones their diameter may be over 1000 miles. "The term cyclone should not be applied to the tornado, waterspout, or twister."[1]

Results indicate seniors are prone to regard cyclones as violent windstorms. They do not think of the term in connection with its true meteorological implications.

8. The American farmer has better opportunities to make a living than the Japanese farmer. (a)( )( )

93% answered correctly; 5% incorrectly; 2% were uncertain.

No one would deny that the general standard of living in the United States is higher than that in Japan. "The typical

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1. Webster's Dictionary.

Japanese farmer is a poor man, burdened with debt."[1] His standard of living is generally below the average for the nation.

9. In the Temperate Zone the sun is never directly overhead. (a)( )( )

42% answered correctly; 45% incorrectly; 13% were uncertain.

No one who understands earth-sun relationships would question this fact.[2] Yet a plurality of seniors declared this statement false.

10. In Boston we have more hours of daylight on June 21st than on August 21st. (a)( )( )

68% answered correctly; 22% incorrectly; 10% were uncertain.

The writer expected the majority to respond correctly to this statement. All school geographies that make any mention of earth-sun relationships state the fact that in the northern hemisphere June 21st is the first day of summer and the longest day of the year. The results confirmed his expectations.

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1. Encyclopaedia Britannica, Encyclopaedia Britannica Inc., Chicago, Illinois, 1947, Vol. 12, p. 936.

2. Goode, Paul J., School Atlas, Rand McNally & Co., New York, 1943, p. 1.

11. In area France is larger than Texas. ( )(d)( )

63% answered correctly; 29% incorrectly; 8% were uncertain.

The area of France is 212,659 square miles; the area of Texas is 267,339 square miles.[1] This single state of the United States is larger than an important European nation!

Relatively few had a misconception on this point.

12. It is always cold in the Frigid Zone. ( )(d)( )

49% answered correctly; 45% incorrectly; 6% were uncertain.

A glance at the climatic map of the world in Goode's Atlas should serve to convince anyone that the region north of the Arctic Circle is not always cold.[2] The normal July temperature is over fifty degrees in many places. The daily summer temperature may be in the eighties.

The presence of the "specific determiner" always did not deter 45% from agreeing with the statement. This indicates a sizeable group have wrong impressions of the climate in the far north.

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1. Statesman's Year-Book, pp. 875, 645.
2. Goode, School Atlas, p. 13.

*13. El Paso, Texas is nearer to Texarkana, Texas than is Chicago, Illinois. ( )(d)( )

25% answered correctly; 51% incorrectly; 24% were uncertain.

The distance between El Paso and Texarkana is approximately 740 miles; the distance between Texarkana and Chicago is approximately 680 miles. It takes longer to traverse Texas from El Paso to Texarkana than to start from Texarkana, cross Arkansas, Missouri, and most of Illinois and arrive in Chicago.

Results indicate the majority have a poor concept of relative distances between points in Texas. It is encouraging to note, however, that almost one quarter of the seniors expressed no judgment. They, presumably, would check with the map first.

14. Airplanes leaving New York for Calcutta, India via the shortest route head either east or west. ( )(d)( )

44% answered correctly; 32% incorrectly; 24% were uncertain.

The shortest distance between any two points on the globe is a great circle. Airplanes following the great circle route between New York and Caluctta would fly in a northerly direction on the first stage of their journey.[1]

A few of the seniors who indicated this statement was true admitted afterwards that they had been thinking in terms of the Mercator map.

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1. This may be verified on any globe.

15. There are occasional hailstorms in the tropics. (a)( )( )

56% answered correctly; 32% incorrectly; 12% were uncertain.

Hail refers to "small, roughly spherical lumps of approximately concentric shells of clear ice and compact snow, collectively, that are precipitated during thunderstorms". Although hailstorms are most frequent in middle latitudes, they may occur in connection with any thunderstorms.[1]

16. The growing season north of the Arctic Circle is short. (a)( )( )

79% answered correctly; 13% incorrectly; 8% were uncertain.

The greater the number of days the temperature is above freezing, the longer the growing season. North of the Arctic Circle the number of days in which the temperature is high is small.[2]

What confusion there was with this item was concerned with the meaning of the term growing season. A few who disagreed with this statement did so because they thought, incorrectly, that there was no growing season north of the Arctic Circle.

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1. Webster's Dictionary.

2. Semple, Ellen C., Influences of Geographic Environment, Henry Holt & Co., New York, 1911, pp. 633-34.

17. Parallels of latitude are shown on most maps as vertical lines. ( )(d)( )

48% answered correctly; 41% incorrectly; 11% were uncertain.

A parallel of latitude is "one of the imaginary circles on the surface of the earth parallel to the equator marking the latitude."[1] On the Mercator map parallels are horizontal; on polar maps they are circular. They are rarely drawn vertically.[2]

The number who answered this incorrectly is inordinately large. It would be well to investigate this further.

18. The distance from any point on the Arctic Circle to the North Pole is less than one thousand miles. ( )(d)( )

35% answered correctly; 37% incorrectly; 28% were uncertain.

The distance from the Arctic Circle to the Pole is $23\frac{1}{2}^{o}$, or in terms of miles, approximately 1600 miles.

Since this region receives little emphasis in geography books, many seniors think of it as being smaller than it really is. The "hop" over the pole, from Arctic Circle to Arctic Circle, is over 3000 miles.

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1. Webster's Dictionary.
2. Goode, School Atlas, p. 2.

19. Every place in the Torrid Zone is hot. ( )(d)( )

46% answered correctly; 49% incorrectly; 5% were uncertain.

Places of high elevation are cold even though they are in the torrid zone.[1]

Many were confused by the term torrid. Forty-nine per cent gave a definite answer and that the wrong one. We may reasonably imply from this that they have heard the term before and were fairly confident they understood it.

20. Mountain Everest is the highest mountain in the world. (a)( )( )

59% answered correctly; 38% incorrectly; 3% were uncertain.

Mt. Everest is 29,002 feet in elevation, far greater in height than Mt. Whitney (14,500 feet) which a few gave as the highest mountain.[2]

The currently publicized Reynold's expedition to find the whereabouts of a mountain reported higher than Everest prompted quite a few to disagree with this statement.

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1. Goode, School Atlas, p. 16.

2. Encyclopaedia Britannica World Atlas, C. S. Hammond & Co., Inc., New York, 1944, p. 6.

*21. Mountains are always higher than hills. ( )(d)( )

19% answered correctly; 80% incorrectly; 1% were uncertain.

A hill, as generally used, "is a more or less rounded elevation as contrasted with a peaked or precipitous one." The term has been sometimes applied arbitrarily. Mountains are not necessarily higher than hills - the Black Hills of the Dakotas range as high as 7,216 feet in elevation; the highest of the White Mountains is only 6,293 feet.[1]

Four-fifths of the seniors were totally unaware of this.

*22. Cows are sacred throughout India. ( )(d)( )

21% answered correctly; 74% incorrectly; 5% were uncertain.

The Hindus regard cows as sacred. But the Hindus are not the sole occupants of India. In addition to the 255,030,506 Hindus there are 94,389,428 Moslems, and the Moslems do not regard the cow as sacred.[2]

The fact that cows are held sacred by Hindus had been too well learned by the seniors tested. They had a definite misconception on this point.

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1. Webster's Dictionary.
2. Statesman's Year-Book, p. 113.

*23. The sun is nearer to the earth in July than in January. ( )(d)( )

41% answered correctly; 56% incorrectly; 3% were uncertain.

In January the sun is approximately 91½ million miles away; in June 94½ million miles away.[1]

The majority of the seniors apparently thought the nearness of the sun determined the type of weather.

24. New York city is more than 900 miles from Boston. ( )(d)( )

85% answered correctly; 10% incorrectly; 5% were uncertain.

The distance between New York and Boston (approximately 250 miles) was greatly exaggerated. Yet in spite of this 10% said the statement was true. A few later revealed that they had never traveled over 50 miles from their home town. To them 250 miles was a long way; 900 miles, too, was a long way. So they agreed with the statement.

25. The Magnetic North Pole is less than 50 miles away from the Geographic North Pole. ( )(d)( )

31% answered correctly; 34% incorrectly; 35% were uncertain.

The location of the Magnetic North Pole can be found on any globe. It is 71°N. latitude, 96°W. longitude, or over 1000 miles from the geographic Pole.

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1. Goode, School Atlas, p. 1.

Over one third of the group tested believed the magnetic pole and geographic pole were very near each other. An even larger group indicated, by checking the third column, that they had never considered this before. Yet this seems to be a bit of information that is quite important in this "air age".

26. Abundance of food available for the picking may be found in any jungle. ( )(d)( )

57% answered correctly; 34% incorrectly; 9% were uncertain.

A jungle, according to the dictionary, is any "impenetrable thicket or tangled mass of vegetation".[1]

Just why 34% agreed with this statement is difficult to imagine.

*27. In the Torrid Zone the sun is always directly overhead at noon. ( )(d)( )

36% answered correctly; 50% incorrectly; 14% were uncertain.

The position of the sun varies. In June it is over the Tropic of Cancer; in December over the Tropic of Capricorn.[2]

This misconception about the Torrid Zone which Aitchison found common among pupils in the grades[3] still persists among seniors.

1. Webster's Dictionary.
2. Goode, School Atlas, p. 1.
3. See above, p. 19.

*28. Snow never falls in the Torrid Zone. ( )(d)( )

37% answered correctly; 53% incorrectly; 10% were uncertain.

Geography textbooks abound in illustrations of snow-capped mountain peaks in the tropics. Yet, apparently, this has made no impression. The misconception endures.

29. The water level in Lake Superior is usually the same as the water level in Lake Michigan. ( )(d)( )

47% answered correctly; 33% incorrectly; 20% were uncertain.

Approximately a third of the seniors agreed with the statement. They had been accustomed to seeing the Great Lakes pictured on flat maps colored similarly. Had they considered the fact that water from Lake Superior eventually flows to the Atlantic via the St. Lawrence, their answers might have been different.

30. If the world were cut into an eastern and western hemisphere, Europe, Asia, and Africa would fall entirely in the eastern hemisphere. ( )(d)( )

53% answered correctly; 36% incorrectly; 11% were uncertain.

The majority realized that it is impossible to divide the world in a clear-cut fashion into eastern and western hemispheres. If we used the meridian 20°W. and the meridian 160°E. of Greenwich as the dividing lines, Europe and Africa would fall entirely in the eastern division but the Kamchatka peninsula of Asia would extend into the western hemisphere.

31. The moon is smaller than the sun. (a)( )( )

77% answered correctly; 17% incorrectly; 6% were uncertain.

The moon's diameter is 2160 miles. The sun's diameter is 864,000 miles.[1] The moon is very, very much smaller. But a few are still fooled by the nearness of the moon into thinking it is large.

32. The Arabians regard Jerusalem as a holy city. (a)( )( )

34% answered correctly; 62% incorrectly; 4% were uncertain.

"The Arabians usually designate Jerusalem by names expressive of holiness."[2] To them, as to the Christians, Jerusalem is a holy city.

Though this is a true statement 62% disagreed with it. Thoughts of Mecca and Medina and infidels obscured their vision.

*33. The average January temperature in Juneau, Alaska is less than ten degrees Fahrenheit. ( )(d)( )

25% answered correctly; 50% incorrectly; 25% were uncertain.

Actually the January average in Juneau is 27.5°F.[3]

Many seniors, however, regard Alaska as being extremely cold.

1. Goode, School Atlas, p. 1.
2. Encyclopaedia Britannica, vol.13, p.5.
3. Climate and Man, Yearbook of Agriculture, United States Government Printing Office, Washington, D.C., 1941, p. 1121.

*34. The area of Greenland is larger than the area of Arabia. ( )(d)( )

29% answered correctly; 56% incorrectly; 15% were uncertain.

Greenland is 840,000 square miles in area; Arabia is over 1,000,000 square miles in area.[1]

Yet many, probably influenced by the false impressions of area they acquired from the Mercator map, continue to believe Arabia is the smaller.

35. Siestas are common in South America because the people are lazy. ( )(d)( )

76% answered correctly; 20% incorrectly; 4% were uncertain.

Siesta refers to the short nap taken at midday by people living in warm climates.[2] It does not denote laziness.

A gratifying proportion of the tested showed they understood this.

36. The Hindus regard the Ganges as a sacred river. (a)( )( )

79% answered correctly; 10% incorrectly; 11% were uncertain.

The results show this fact is generally known.[3]

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1. Statesman's Year-Book, pp. 827, 890.
2. Webster's Dictionary.
3. Encyclopaedia Britannica, Vol. 10, p. 16.

37. The population of Boston is greater than the population of the entire state of New Hampshire. (a)( )( )

37% answered correctly; 54% incorrectly; 9% were uncertain.

The population of Boston as given in the Stateman's Year-Book is 770,816; that of the state of New Hampshire is 491,524.[1]

It was a matter of surprise to the writer to note the proportion of students living in the vicinity of Boston who were unaware of this fact.

38. If a pilot flies due south from Detroit, Michigan, the first foreign country he will fly over will be Canada. (a)( )( )

19% answered correctly; 74% incorrectly; 7% were uncertain.

This fact may be verified by reference to any map of Detroit and vicinity.

Again this was not a misconception item but results proved interesting. Canada seems to be generally regarded in the schools as a country "up north somewhere".

*39. Canada receives fewer total hours of sunlight during the year than Florida. ( )(d)( )

25% answered correctly; 63% incorrectly; 12% were uncertain.

In reality the total hours of sunlight received in the

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1. Statesman's Year-Book, pp. 592, 610.

course of a year by any region of the world is the same. Winter nights are long near the poles, but long summer days compensate for this.[1]

Many had the mistaken notion that Florida receives more hours of daylight.

40. The average January temperature of Boston is more than twenty-five degrees Fahrenheit (25°F.). (a)( )( )

44% answered correctly; 47% incorrectly; 9% were uncertain.

The average January temperature for Boston is given as 29.8°F. in Climate and Man.[2] The average for the present year (1948), however, was a few degrees below this. This undoubtedly affected students responses.

41. Connecticut is the smallest state in the United States. ( )(d)( )

96% answered correctly; 3% incorrectly; 1% were uncertain.

The area of Connecticut is 4,899 square miles; the area of Rhode Island is 1,058 square miles.[3]

Only a negligible proportion failed to answer this correctly.

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1. Goode, School Atlas, p. 1.
2. Climate and Man, p. 992.
3. Statesman's Year-Book, p. 506.

42. Rocks in fields sometimes increase in size from year to year.
( )(d)( )

57% answered correctly; 36% incorrectly; 7% were uncertain.

Rocks subjected to the forces of weathering in fields gradually disintegrate and, thereby, become smaller.[1]

A surprising number, over one third, possessed a misconception on this item. A few offered explanations for their answer - wrote one "farmers who throw all large rocks out of their fields one spring often find more large rocks the following spring".

*43. A telegraph message sent from Boston, Mass. at 6 p.m. January 10 would arrive in Tokyo, Japan on January 9 (difference in date due to crossing of International Date Line).
( )(d)( )

28% answered correctly; 59% incorrectly; 13% were uncertain.

When the International Date Line is crossed going westward the date becomes a day later.[2]

Fifty-nine per cent had the misconception of thinking our calendar is dated twenty-four hours ahead of those in Japan.

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1. Encyclopaedia Britannica, Vol. 17, pp. 670-81.
2. Webster's Dictionary.

44. Canada's population is a little over half that of the United States. ( )(d)( )

45% answered correctly; 40% incorrectly; 15% were uncertain.

The population of Canada is 11,506,655; that of the United States 131,669,295. Canada has less than one tenth as many people as the United States.[1]

Results show a tendency to overestimate the population of Canada.

*45. The newer world maps are more useful than the old because they have no distorted facts. ( )(d)( )

37% answered correctly; 53% incorrectly; 10% were uncertain.

It is impossible to map the round earth accurately on a flat piece of paper. Many different projections are used but all contain some distortions.[2]

Results show a majority have a misconception on this point. They profess to believe that the new map is the perfect map.

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1. Statesmans Year-Book, pp. 505-6.

2. See Goode, School Atlas, p. 2 for a concise explanation of the limitations of the various projections.

46. The best fishing grounds are usually found on a continental shelf. (a)( )( )

64% answered correctly; 16% incorrectly; 20% were uncertain.

By best was meant most profitable fisheries. These are all in relatively shallow waters near continents.[1]

The majority responded to this statement as the writer expected them to.

*47. The northern boundary of Maine is north of the northern boundary of Minnesota.

35% answered correctly; 54% incorrectly; 11% were uncertain.

Minnesota's boundary at Lake Woods extends north of 49° N. latitude; the boundary of Maine at no point reaches even to the 48th degree of latitude.[2]

Still the majority believe Maine extends northernmost.

The widespread use of the Lambert Conformal projection in mapping the United States, along with misunderstandings of latitude, probably is the cause of this misconception.

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1. World Book Encyclopedia, Quarrie Corporation, Chicago, 1946, Vol. 6, pp. 2439-2446.

2. This may be verified on any map.

*48. Tigers are found in Africa. ( )(d)( )

17% answered correctly; 80% incorrectly; 3% were uncertain.

This is not true. "Tigers are exclusively Asiatic."[1]

The fact that so many falsely believe tigers are found in Africa is difficult to explain. Is this example of students placing animals in a region thousands of miles from where they actually exist unique? Or can one infer from this that many of the ideas pupils have of the location of flora and fauna are so vague as to be useless?

49. Latitude means the distance north or south of the equator. (a)( )( )

59% answered correctly; 34% incorrectly; 7% were uncertain.

The definition is the dictionary's.[2]

The writer was disappointed with the responses to this item. He had expected an unanimous agreement with this statement. Seniors who presumably have used geography frequently in the course of their high school studies should have no question about the meaning of latitude. In spite of this, over one third responded incorrectly.

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1. Encyclopaedia Britannica, Vol. 22, p. 209.
2. Webster's Dictionary.

*50. More than 75% of the land of Aroostook County, Maine is devoted to raising potatoes. ( )(d)( )

11% answered correctly; 69% incorrectly; 20% were uncertain.

The area of Aroostook County, Maine is 6,408 square miles or over four million acres. One hundred fifty-six thousand acres, at the most, are devoted to raising potatoes.[1] This is less than four per cent of the area.

Over two thirds had the mistaken notion that practically all land in Aroostook was devoted to raising the crop to which Aroostook owes its fame.

51. In the Temperate Zone it is never as hot as in the Torrid. ( )(d)( )

48% answered correctly; 45% incorrectly; 7% were uncertain.

Here again 45% indicated they believed Temperate and Torrid zone boundaries are sharply defined lines coinciding with climatic zones.[2]

The presence of this belief indicates that the teaching of climates in schools has been over simplified and unrealistically taught. The fact that a plurality had this item correct is encouraging.

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1. Statistical Abstract of the United States, United States Government Printing Office, Washington, D.C., 1944, p. 658 .

2. See the Climatic Map, Goode, School Atlas, pp. 16-7.

52. France and Portugal have colonies in India. (a)( )( )

32% answered correctly; 53% incorrectly; 15% were uncertain.

Karikal and Yanson are French colonies; Diu is Portuguese.[1]

The majority who answered incorrectly probably considered India as wholly English. They were doudtless influenced by the fact that "English" India has been in the limelight for quite some time.

53. The Niagara Falls are the biggest falls in the world. ( )(d)( )

51% answered correctly; 45% incorrectly; 4% were uncertain.

The Niagara Falls are only 167 feet high. Kukenaan Falls in British Guiana are over 2000 feet high. There are over fifty falls in the world higher than Niagara.[2]

Niagara Falls have been frequently publicized in the United States. This fact alone may account for the large group (45%) that believes the Niagara Falls are the biggest.

54. All places in the Frigid Zone have a period of six month's darkness followed by a period of six month's daylight. ( )(d)( )

41% answered correctly; 46% incorrectly; 13 % were uncertain.

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1. See any political map of India.

2. Encyclopaedia Britannica World Atlas, p. 3.

The results show a plurality have mistaken notions as to the characteristics of the winter and summer seasons at the Poles.[1]

55. Africa is a country. ( )(d)( )

66% answered correctly; 28% incorrectly; 6% were uncertain.

Africa is a continent composed of a collection of countries and colonies.[2] A few individuals by their responses showed inability to distinguish between a country and a continent.

56. The continental shelf extends three miles from the shores of the United States. ( )(d)( )

29% answered correctly; 43% incorrectly; 28% were uncertain.

It can be seen on any physical map of the world that the continental shelf, the area of relatively shallow water adjoining a continent, is not restricted to any particular mileage. At places it is over a hundred miles in width.

Students apparently confused the continental shelf with the international law of long standing that gives a nation control of the water area for three miles off shore.

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1. Goode, School Atlas, p. 1.
2. See any political map of Africa.

57. The mouth of the Mississippi is nearer the center of the earth than its source. ( )(d)( )

26% answered correctly; 49% incorrectly; 25% were uncertain.

Lake Itasca, source of the Mississippi, is 1460 feet in elevation.[1] Yet, since the earth is an oblate spheroid and the diameter of the earth in that latitude (47°) is approximately two miles shorter, the lake is actually nearer the center of the earth than the mouth of the Mississippi.[2]

This concept may be too difficult for high school seniors. The few that responded correctly to this item may have done so inadvertently as a result of confusing the meaning of mouth and source of rivers.

58. It never rains in the desert. ( )(d)( )

76% answered correctly; 22% incorrectly; 2% were uncertain.

Deserts, according to the dictionary, are regions where the annual precipitation is less than ten inches.[3] Of course it rains occasionally.

59. A river is usually wider at its mouth than at its source. (a)( )( )

70% answered correctly; 19% incorrectly; 11% were uncertain.

1. Webster's Dictionary.
2. Encyclopaedia Britannica, vol. 7, pp. 230-1.
3. Webster's Dictionary.

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The mouth of the river is where it empties into the sea, ocean, or lake.[1] Naturally it is wider here.

A few, however, had the notion that rivers start on the coast since it is easier to trace rivers on maps in this fashion.

60. Miami, Florida has more hours of daylight in June than Boston. ( )(d)( )

50% answered correctly; 39% incorrectly; 11% were uncertain.

Anyone who has an understanding of earth-sun relationships immediately sees the absurdity of this statement. In summer as we go nearer and nearer to the North Pole the days get longer and longer. Boston is in a higher latitude; naturally it has more hours of sunlight in June.

61. Natural sponges are picked-clean skeletons of animals. (a)( )( )

49% answered correctly; 44% incorrectly; 7% were uncertain.

This statement, taken from the dictionary, was meant to be obvious. Apparently the pupils tested did not so consider it.

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1. Webster's Dictionary.

62. The growing season in Buenos Aires, Argentina is longer than the growing season in Rio de Janeiro, Brazil.
( )(d)( )

49% answered correctly; 19% incorrectly; 32% were uncertain.

As we leave the equator and travel toward the Poles the length of the growing season for places of the same elevation becomes progressively shorter.[1] Results show relatively few have this misconception but many are puzzled by this statement.

63. Any straight line on a gnomonic map is a great circle.
(a)( )( )

45% answered correctly; 18% incorrectly; 37% were uncertain.

The fact that straight lines are great circles on the gnomonic makes it a useful air age map. This statement is admittedly difficult. It was included as a challenge to the brighter pupils.

64. A very small fraction of the heat given off by the sun is received by the earth. (a)( )( )

75% answered correctly; 21% incorrectly; 4% were uncertain.

We see this is so when we stop to consider that the earth is one millionth the size of the sun, a speck in space, ninety million miles away from its heat.

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1. Dodge, R. E. and Dodge, S. D., Foundations of Geography, Doubleday Doran & Company, Garden City, New York, 1937, pp. 125-6.

65. In the Temperate Zone it is sometimes as cold as in the Frigid. (a)( )( )

68% answered correctly; 23% incorrectly; 9% were uncertain.

The weather in January, at the time the test was being administered, came to the assistance of the students. Newspapers played up the fact that the temperature at the time was lower in Massachusetts than in the Arctic station being maintained by the Armed Forces for the purpose of testing the effectiveness of cold weather equipment.

66. Camphor trees grow in Formosa. (a)( )( )

45% answered correctly; 16% incorrectly; 39% were uncertain.

The fact that camphor trees grow in Formosa[1] has much less significance now that camphor is being successfully made synthetically.

67. The tuna fish is a relatively large fish. (a)( )( )

85% answered correctly; 12% incorrectly; 3% were uncertain.

Tuna fish sometimes weigh a thousand pounds.[2] Most students are aware of this.

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1. Encyclopaedia Britannica, Vol. 4, p. 681.
2. Webster's Dictionary.

*68. Most of the rivers of the world flow north. ( )(d)( )

33% answered correctly; 50% incorrectly; 17% were uncertain.

A half of the seniors tested had this misconception. They regard north as up and consequently think of rivers as flowing south. A glance at a physical map shows that the directions in which rivers flow varies widely. No compass direction is found to predominate. Three of the four largest rivers, in fact, have a northerly direction of flow.[1]

69. Boston is a little farther north of the equator than is London. ( )(d)( )

55% answered correctly; 30% incorrectly; 15% were uncertain.

The latitude of Boston is 42°, the latitude of London is 52°. The similarity of climate leads some to think that both cities are in the same latitude.

70. Many minerals are found in rocks. (a)( )( )

93% answered correctly; 5% incorrectly; 2% were uncertain.

A rock is a mass of solid mineral matter.[2]

Agreement was almost unanimous.

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1. Encyclopaedia Britannica World Atlas, p. 5.
2. Webster's Dictionary.

71. There is one national language in China understood and spoken by most of the people. ( )(d)( )

49% answered correctly; 47% incorrectly; 11% were uncertain.

In China there is no common language of the lips. "A linguistic map of China would suggest a quilt lacking all unity."[1]

A plurality were aware of this fact.

72. The area of Canada is larger than that of the United States. (a)( )( )

63% answered correctly; 31% incorrectly; 6% were uncertain.

The area of Canada is 3,462,103; the area of the United States is 2,977,128 square miles.[2]

Seniors generally agree.

73. Sugar beets are grown in Minnesota. (a)( )( )

65% answered correctly; 22% incorrectly; 13% were uncertain.

This may be confirmed by referring to the economic map on page 29 of Goode's Atlas.

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1. Encyclopedia Americana, Americana Corporation, New York, 1936, Vol. 6, p. 556.

2. Statesmans Year-Book, pp. 321, 506.

74. To measure the shortest distance between two points on the earth's surface specially constructed globes (not the kind found in most classrooms) must be used.

( )(d)( )

31% answered correctly; 48% incorrectly; 21% were uncertain.

Distances may be approximated on any globe by using a piece of string. The piece of string may be placed along a meridian to convert its length into degrees of latitude. This number multiplied by sixty-nine will give the distance in miles.[1]

The writer feels that the publicity given new globes is unfortunate as it has apparently led many to neglect using the globes they have at their disposal.

75. Earthquakes on the ocean floor may cause tidal waves.

(a)( )( )

90% answered correctly; 4% incorrectly; 6% were uncertain.

A tidal wave is a great sea wave which commonly follows earthquakes.[2]

Tidal waves are practically non-existent in the immediate vicinity of New England. In spite of this fact knowledge of them was found to be widespread.

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1. Raisz, Erwin, General Cartography, McGraw-Hill Book Co., Inc., New York, 1938, pp. 71-80.

2. Webster's Dictionary.

76. It takes less than one second, by means of short-wave radio or underwater cable, for a person speaking in Boston, Mass. to be heard in Shanghai, China. (a)( )( )

42% answered correctly; 42% incorrectly; 16% were uncertain.

The speed of transmission of sound through the medium of the radio is the speed of electricity - 186,000 miles a second. Obviously electricity could carry the message around this 24,000-mile earth many times in the course of a second.

77. St. Johns, Newfoundland is on the direct air route between New York and Rome. (a)( )( )

31% answered correctly; 39% incorrectly; 24% were uncertain.

The truth of this statement may be checked on any globe.

Common use of the Mercator map in the schools probably accounts for the misconception being possessed by 39%.

78. The width of a river at any point may be easily found on any map. ( )(d)( )

75% answered correctly; 17% incorrectly; 8% were uncertain.

The seventeen per cent who agreed with this statement probably never were confronted with the task of looking up the width of a river or they would have immediately seen the impossibility of estimating the width of a river measured in feet on maps drawn to the scale of thirty or more miles to the inch.

79. All seas contain salt water. ( )(d)( )

54% answered correctly; 40% incorrectly; 6% were uncertain.

The majority of the seas are salt, but there are exceptions. The Sea of Galilee is one of the more famous fresh water seas.

80. New York is farther south than Boston. (a)( )( )

73 % answered correctly; 21% incorrectly; 6% were uncertain.

The latitude of New York is approximately 40°N.; the latitude of Boston is approximately 42°N.

This statement does not say that New York is directly south of Boston. Nevertheless, a number read this implication into the wording.

81. Wild elephants live in the forests of Burma. (a)( )( )

67% answered correctly; 17% incorrectly; 16% were uncertain.

Burma is one of the few countries of the world where elephants still live in the forests untamed.[1] This fact appears to be generally known.

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1. Encyclopaedia Britannica, vol. 4, p. 426.

82. All the inhabitants of India other than the "Untouchables" are members of some caste. ( )(d)( )

34% answered correctly; 44% incorrectly; 22% were uncertain.

Ninety-four million Moslems live in India. These are not divided into castes.

The presence of this misconception among 44% probably is to be accounted for by the fact that the belief is general that India is predominately Hindu.

83. The average January temperature of Rio de Janeiro, Brazil is 78°F. (a)( )( )

51 % answered correctly; 17% incorrectly; 32% were uncertain.

The statement is entirely accurate.[1]

The majority were not disturbed by having the January temperature so high.

84. At the North Pole the sun appears to rise in the east and sink in the west. ( )(d)( )

34% answered correctly; 43% incorrectly; 23% were uncertain.

The fact that 43% answered incorrectly denotes serious misunderstanding of latitude. The only possible direction away from the North Pole is south.

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1. Climate and Man, p.675.

85. Magellan was the first man to sail around the southern part of South America. (a)( )( )

47% answered correctly; 20% incorrectly; 9% were uncertain.

This statement was meant to be true. The phraseology could be much improved. Magellan was the first European captain in charge of an expedition to sail around South America.[1] Other men, of course, sailed with him.

86. Subway systems are more common in the United States than in Europe. ( )(d)( )

47% answered correctly; 46% incorrectly; 7% were uncertain.

While subway systems exist in eight European cities, they are found in only three in the United States.[2]

The fact that the seniors tested all lived near Boston, in which there is a subway system, undoubtedly influenced them in answering.

*87. San Diego, California is west, not east, of Reno, Nevada. ( )(d)( )

24% answered correctly; 63% incorrectly; 13% were uncertain.

The longitude of San Diego, California is approximately 117°W.; the longitude of Reno is 120°W. Reno is west of

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1. Encyclopaedia Britannica, Vol.14, p. 623.

2. Geographic School Bulletin, National Geographic Society, Washington, D. C., April 19, 1943.

San Diego.

The prevalence of this misconception may be due to widespread use of the Lambert Conformal maps of the United States in the schools. On such maps San Diego appears, because of the convergence of meridians as they approach the Pole, to be to the left of Reno. This leads many who lack proficiency in reading maps to assume Reno is easternmost.

88. Columbus was the first man to believe the earth is round. ( )(d)( )

54% answered correctly; 42% incorrectly; 4% were uncertain.

Early geographers, Eratosthenes foremost among them, are forgotten by 42% and Columbus is mistakenly credited with being the first to believe the earth is round.[1]

*89. The farther south we go the warmer it gets. ( )(d)( )

41% answered correctly; 54% incorrectly; 5% were uncertain.

The presence of this misconception among the majority of seniors strengthens the writer's belief that seniors generally do not understand the significance of latitude or earth-sun relationships.

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1. Raisz, General Cartography, pp. 8-20.

90. Sharks are worthless to fishermen. ( )(d)( )

66% answered correctly; 26% incorrectly; 8% were uncertain.

"In recent years extensive fisheries for sharks have developed starting in Carolina and spreading to Africa, Australia, etc."[1] Sharks, as the majority of seniors know, are valuable.

Results of the Investigation of Group Scores

Results already summarized in the foregoing section indicate certain misconceptions which are rampant in the high school. Are these prevalent misconceptions scattered indiscriminately throughout the school or are they confined to particular groups? Following is a summary of the findings of the investigator's attempts to arrive at the answer to this question.

All papers were corrected on the basis of the nineteen most prevalent misconceptions (those possessed by 50% or more). The total number of misconceptions which each pupil had were recorded. Those students who had the greater number of misconceptions received the higher numerical rating. Those who had a good understanding of geography, or were aware of their limitations in this respect, received a low score. This method

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1. Encyclopaedia Britannica, Vol. 20, p. 466.

of scoring admittedly favored the cautious, who placed their checks frequently in the third or uncertain column, while it penalized those who hazarded a guess on every item and scarcely ever used the uncertain column.

In Table I, page 65, the scores are divided into two groups, boys' scores and girls' scores. We learn from this table that the scores of the 226 boys tested ranged from one to seventeen; that the average number of misconceptions they possessed was 11.02. The scores of the 284 girls tested ranged from one to eighteen; the average number of misconceptions they possessed was 11.94. The difference between the two groups is slight. The small difference there is favors the boys.

In Table II, page 66, the scores are divided into six groups according to the age, to the nearest whole number, of the pupils tested. The slight differences found generally favored the older groups. The average of the two fifteen-year-old seniors, eight misconceptions apiece, is best. But we should not infer too much from a pair of cases. The eighteen-year-olds have slightly better scores than the seventeen-year-olds; the seventeen-year-olds slightly better scores than the sixteen-year-olds. The group of twenty-year-olds, consisting mainly of veterans, have slightly fewer misconceptions than any of the other sizeable age groups.

TABLE I

Scores of Boys and Girls on the Test-Questionnaire

Score	Number of Boys Receiving This Score	Number of Girls Receiving This Score	Total
1	1	1	2
2	1	0	1
3	0	1	1
4	4	1	5
5	2	0	2
6	6	2	8
7	16	14	30
8	9	9	18
9	21	30	51
10	26	25	51
11	40	28	68
12	33	51	84
13	22	35	57
14	20	38	58
15	12	22	34
16	11	16	27
17	2	8	10
18	0	3	3
19	0	0	0
Total	226	284	510
Average	11.02	11.94	11.53

TABLE II

Scores of the Test-Questionnaire

Divided into Groups on the Basis of Age

Number Receiving This Score

Score	Age 15 yrs.	16 yrs.	17 yrs.	18 yrs.	19 yrs.	20 yrs.
1		0	0	2	0	0
2		0	0	1	0	0
3		0	1	0	0	0
4		0	1	4	0	0
5		0	0	0	1	1
6		1	3	4	0	0
7		1	9	16	3	1
8	2	1	2	8	5	0
9		5	18	21	4	3
10		1	20	20	7	3
11		5	32	21	7	3
12		7	24	40	9	4
13		4	23	24	5	1
14		6	22	23	6	1
15		3	13	12	6	0
16		2	9	12	4	0
17		0	4	4	1	1
18		1	1	1	0	0
19		0	0	0	0	0
Totals	2	37	182	213	58	18
Average	8	12.05	11.75	11.32	11.67	10.77

In Table III, page 68, the scores are divided into two groups, those who have not had geography courses in the high school and those who have. The range of scores for the first group is one to eighteen. The average number of misconceptions held is 11.32. The range of scores for the latter group is four to eighteen, the average number of misconceptions held 11.90. The slight difference in scores favors those who have not had a geography course in the high school! On the surface results appear startling. In actuality they are easily explained. Schools in which the tests were given generally did not offer geography courses to college preparatory students. The pupils in the Home Economics and Commercial courses were the ones who had had geography. Because of this, most of the academically superior are to be found in the first group. And thus ability seems here to compensate for lack of experience.

In Table IV, page 69, the scores received by the pupils have been divided into three main groups - the first group contains scores of those who professed an interest in geography as a school subject, the second group contains the scores of those who indicated they had no particular interest in geography, the third group scores of those who expressed an active dislike for geography. The method employed in distributing the pupils among these three categories limits somewhat the number of conclusions that may be drawn from this table.

Those pupils were placed in the first category who satisfied the following three criteria. First, they had indicated

TABLE III

Distribution of Scores on the Test-Questionnaire Received by Pupils Who Have Not Had and Pupils Who Have Had Geography Courses in the High School

Score	Number of Pupils Receiving This Score	
	Have Not Had Geography	Have Had Geography
1	2	0
2	1	0
3	1	0
4	3	2
5	2	0
6	6	2
7	22	8
8	12	6
9	31	20
10	34	17
11	50	18
12	49	34
13	33	24
14	30	28
15	21	13
16	18	9
17	6	4
18	1	2
19	0	0
Total	322	188
Average	11.32	11.90

TABLE IV

Scores on the Test-Questionnaire
Received by Those Who Manifested Like for Geography
Those Who Manifested Dislike for Geography and Others

	Number of Pupils Receiving This Score					
	Like Geography		Neutral		Dislike Geography	
Score	Girls	Boys	Girls	Boys	Girls	Boys
1	1	0	0	0	0	1
2	0	0	0	1	0	0
3	1	0	0	0	0	0
4	0	0	1	4	0	0
5	0	2	0	0	0	0
6	2	5	0	1	0	0
7	5	10	9	4	0	2
8	5	5	4	2	0	2
9	14	13	9	6	7	2
10	14	17	10	7	1	2
11	14	23	8	15	6	2
12	18	17	23	13	10	3
13	14	15	15	6	6	1
14	23	12	12	9	3	0
15	11	7	7	4	4	1
16	10	7	5	3	1	1
17	7	0	1	2	0	0
18	2	0	1	0	0	0
19	0	0	0	0	0	0
Sub-Total	141 (50%)	132 (58%)	105 (37%)	77 (34%)	38 (13%)	17 (8%)
Total	273		182		55	
Average	11.61		11.46		11.38	

that the geography they had learned had helped them in high school. Second, they had indicated that, in their opinion, more geography should be taught in the high school. And third, they had written at least one logical reason for liking the study of geography.

Some of the reasons were little more than enumerations of what the pupil had learned in geography, for example: "Geography gives you a good understanding of the world, the lands of the world, and of the people of the world, and their customs." Though more frequently than not, little notes, intended for teacher consumption, were tacked on: "In addition to this reason, the teacher is a fair marker and easy to get along with." "I have learned more in my geography class than in any other." "The geography, as taught this year was very interesting, colorful, educational."

A number of pupils wrote they liked geography because they found map work enjoyable. "I enjoy doing maps on my own." "I like to print and draw maps, especially those with up-to-date facts." In fact one pupil could not say enough for maps: "The maps are great things to work on!"

Many said they liked geography because it was helping them at the time. It was helping them in school work. "It helps me understand history and history is my favorite subject." "It helps in chemistry and physics because you learn where many elements are found and the conditions under which they are found." It was helping them understand events outside of the

school. "Geography gives a general background and enables you to know and understand places where current events take place." "It is right up with the world of today." "It enables one to understand why people are in the news." "It enables me to understand the problems of today in relation to the countries they originate in." Geography was helping them participate successfully in their environment. "Since I have learned the countries I can take part in arguments more intelligently." "Geography helps me answer questions on quiz programs." "Since I know geography I can help my younger brother and sister."

Many said they liked geography because it would help them in the future. "I am interested in foreign lands and people. Some day I hope to be a missionary." "I am interested in aviation. Aviators must know geography." "I like the sea. I plan to travel." "It will help anyone who travels." A small number, supremely confident geography would help them in the future, yet uncertain as to how it would, simply stated, "A knowledge of geography will be good in time to come."

Several exhibited, in reasons given, a high degree of social consciousness. "Geography lets you know and understand how other people live and think. This understanding is necessary for a united world." "If more people studied geography wrong opinions of other peoples and other lands would be corrected." And this one which impressed the writer - "It is up to us as pre-adults to know the world of today."

It can be seen by reference to Table IV, page 69, that 50% of the girls and 58% of the boys indicated they would like to study more geography. The majority of these never had any geography in the high school. How many of these had a genuine interest, or who many of these were influenced to reply as they did because of the fact that "other fields always appear greener"? The writer is uncertain. The fact remains that the average number of misconceptions held by members of this group was 11.61. Those interested in geography had a slightly greater number of misconceptions than those not interested.

The average number of misconceptions held by those in the third category of Table IV was 11.38 - those that disliked geography had slighter fewer misconceptions! Part of the explanation for this lies in the method of scoring used. If pupils had any doubts about items they could place their check in the third column and this would not be held against them. The proportion of pupils using the third column was a trifle greater for those who disliked geography. And then again, perhaps in reality their dislike was not for geography as much as for the way it had, in their experience, been presented. A few of the reasons given by the twenty-one per cent who said they disliked geography will follow.

Geography was criticized because it was a "dull" subject. "You study about the wrong things, as fisheries, agriculture, cattle, outmoded customs, etc." "You have too much map work and I am not painstaking enough to make maps." "Map making is

a waste of time. If you want to know the shape of a country, look in a book." "You have too many long lists to memorize in geography." "I have no memory for position." "Learning long lists of hard-to-master foreign names and places is a waste of time." "Geography consists of just routine reading and questions." "All the teacher does is talk and give tests."

Geography was characterized as a "futile" study. "Boundaries are constantly changing." "You learn a boundary today - tomorrow it changes and you get all muddled up." "Geography is a waste of time." "Anyone can go to the map find the place referred to, if he looks long enough, without geography study."

In summary, Table IV shows practically no difference in scores made by those who professed to be interested in geography and those who professed to dislike it. The findings are similar to those revealed in Tables I, II, and III. Misconceptions seem to be distributed generally. Girls and boys, younger students and older students, pupils who have had and pupils who have not had geography in the high school, pupils who profess to like and pupils who profess to dislike geography - all seem to harbor misconceptions in the same degree.

CHAPTER V

CONCLUSIONS AND RECOMMENDATIONS

The writer has found in the course of this study that quite a few seniors know little geography and are totally unaware of the fact. Many of those who, as results later proved, did not do well on the test said, upon seeing it, that the test was easy - about materials they had studied in grammar school.

The investigation has disclosed that a great number of seniors who realize they understand little geography are not particularly concerned as they look on it as a grammar school subject, suitable for children but not for them.

The writer believes steps should be taken to combat this attitude on the part of the seniors. The social studies teachers in high schools should try to make their students realize that geography is more than a grammar school subject.

Results disclosed that many misconceptions which are prevalent among sixth, seventh, and eighth graders are prevalent among seniors. Steps should be taken so that the fund of geographic information which students bring from grammar school remain not static, but expand continually through constant use, application, and study in the course of the high school career. Students should emerge from the high school with a far better understanding of geography than they possessed upon entrance.

This is all right for the future, someone might say, but what can the teacher do now with upper classmen in the high

school to improve the situation?

One method for the teacher to attack the problem of getting high school pupils interested in geography might be by way of the nineteen prevalent misconceptions this study has uncovered. These items could be put forth as a challenge to high school students. They could be asked to explain or find out what 250 seniors out of 500 did not know.

The teacher should realize classes vary widely. The nineteen misconceptions found prevalent among seniors in this study are not necessarily those which are the most prevalent in any particular class. Therefore it might well be worth the effort to give a short introductory test, such as suggested in Table V, page 76, to the class. Ensuing discussion could then be limited to misconceptions most prevalent in that class. Activities could be provided to help the individuals possessing misconceptions other than those most prevalent. Remedial geography teaching thus specifically designed for a specific class and for the individuals in that class could be very effective in dispelling misconceptions and clarifying understanding.

This investigation has disclosed geography misconceptions are scattered among all groups in the high school. Remedial geography teaching is as necessary among the younger students as among the older ones, among the good as well as the poorer students. It must not be thought of solely in connection with backward classes.

TABLE V

Suggested Test for High School Students

(Directions to pupils: Following are twenty statements, some true and some false. Check those you believe true by placing a check to the right of the statement.)

1. The farther south we go, the warmer it gets. ___
2. Rhode Island is the smallest state of the United States. ___
3. Regions of dry, rocky wastelands are not deserts. ___
4. A cyclone is a tornado of large extent. ___
5. The distance from Texarkana, Texas to Chicago, Illinois is greater than the distance from Texarkana, Texas to El Paso, Texas. ___
6. Cows are sacred throughout India. ___
7. The sun is nearer to the earth in July than in January. ___
8. In the Torrid Zone the sun is always directly overhead. ___
9. Snow never falls in the Torrid Zone. ___
10. Many minerals are found in rocks. ___
11. The average January temperature in Juneau, Alaska is less than ten degrees Fahrenheit. ___
12. The area of Greenland is larger than the area of Arabia. ___
13. San Diego, California is west of Reno, Nevada. ___
14. Most of the rivers of the world flow south. ___
15. Canada receives fewer total hours of sunlight during the year than does Florida. ___
16. At the time it is 6 P. M., January 9, in Boston, it is 6 P. M., January 10, in Tokyo, Japan. ___
17. The newer world maps are more useful than the old because they have no distorted facts. ___
18. The northern boundary of Maine is north of the northern boundary of Minnesota. ___
19. Tigers are found in Africa. ___
20. More than 75 per cent of the land of Aroostook County, Maine, is devoted to raising potatoes. ___

In conclusion, this study has proved a number of geographical misconceptions are prevalent in the high school and that pupils with and without misconceptions cannot be segregated on the basis of sex, age, interest or experience in geography courses.

How much use is made of geography in the high school? How much geography do pupils learn incidentally in the course of their high school career? How much geography do secondary teachers demand of their students?

To answer these questions more research is urgently needed.

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A P P E N D I X

TABLE VI

List of Misconceptions

(The percentage of the seniors tested who incorrectly thought the item true is indicated to the right of each item.)

1.	Tigers are found in Africa.	80%
2.	Mountains are always higher than hills.	80%
3.	Cows are sacred throughout India.	74%
4.	More than 75% of the land of Aroostook County, Maine is devoted to raising potatoes.	69%
5.	San Diego, California is west (not east) of Reno, Nevada.	63%
6.	Canada receives fewer total hours of sunlight during the year than Florida.	63%
7.	A telegraph message sent from Boston, Mass. at 6 p.m. January 10 would arrive in Tokyo, Japan on January 9 (difference in date due to crossing of International Date Line).	59%
8.	A cyclone is a tornado of large extent.	59%
9.	Regions of dry, rocky wastelands are not deserts.	57%
10.	The area of Greenland is larger than the area of Arabia.	56%
11.	The sun is nearer to the earth in July than in January.	56%
12.	The northern boundary of Maine is north of the northern boundary of Minnesota.	54%
13.	The farther south we go the warmer it gets.	54%
14.	The newer world maps are more useful than the old because they have no distorted facts.	53%
15.	Snow never falls in the Torrid Zone.	52%
16.	El Paso, Texas is nearer to Texarkana, Texas than is Chicago, Illinois.	51%
17.	Most of the rivers of the world flow south.	50%
18.	In the Torrid Zone the sun is always directly overhead at noon.	50%
19.	Every place in the Torrid Zone is hot.	50%
20.	The mouth of the Mississippi is nearer the center of the earth than its source.	49%
21.	The average January temperature in Juneau, Alaska is less than ten degrees Fahrenheit (10^{o}F).	48%
22.	To measure the shortest distance between two points on the earth's surface specially constructed globes (not the kind found in most classrooms) must be used.	48%
23.	There is one national language in China understood and spoken by most of the people.	47%
24.	Spanish is spoken by more people in Madrid than in any other city of the world.	46%
25.	All places in the Frigid Zone have a period of six month's darkness followed by a period of six month's daylight.	46%
26.	Subway systems are more common in the United States than in Europe.	46%
27.	In the Temperate Zone it is never as hot as in the Torrid.	45%

28. It is always cold in the Frigid Zone. 45%
29. The Niagara Falls are the biggest falls in the world. 45%
30. All the inhabitants of India other than the "Untouchables" are members of some caste. 44%
31. The continental shelf extends three miles from the shores of the United States. 43%
32. At the North Pole the sun appears to rise in the east and sink in the west. 43%
33. Columbus was the first man to believe that the earth is round. 42%
34. Parallels of latitude are shown on most maps as vertical lines. 41%
35. Canada's population is a little over half that of the United States. 40%
36. All seas contain salt water. 40%
37. Miami, Florida has more hours of daylight in June than Boston. 39%
38. Prevailing winds are strong winds. 39%
39. The distance from any point on the Arctic Circle to the North Pole is less than one thousand miles. 37%
40. If the world were cut into an eastern and western hemisphere, Europe, Asia, and Africa would fall entirely in the eastern hemisphere. 36%
41. Rocks in fields cometimes increase in size from year to year. 36%
42. The Magnetic North Pole is less than fifty miles away from the geographic North Pole. 34%
43. Abundance of food available for the picking may be found in any jungle. 34%
44. The water level in Lake Superior is usually the same as the water level in Lake Michigan. 33%
45. Airplanes leaving New York for Calcutta, India via the shortest route head either east or west. 32%
46. Boston is a little farther north of the equator than is London. 30%
47. Moscow is nearer to Miami, Florida than to Seattle, Washington. 29%
48. In area France is larger than Texas. 29%
49. Africa is a country. 28%
50. Sharks are worthless to fishermen. 26%
51. It never rains in the desert. 22%
52. The growing season in Buenos Aires, Argentina is longer than the growing season in Rio de Janeiro, Brazil. 19%
53. The width of a river at any point may be easily found on any map. 17%

Geographical Questionnaire

This is an interesting and easy test. It will not take you long. Answer the questions quickly. Your answers will not affect your mark in this course. The answers will be used to find out how much interest you, and other seniors, have in geography.

Name: _____ School: _____

Age: _____(Years) _____(Months) Sex: Male _____ Female _____

Part I

1. What courses in geography have you had in high school?

   Name of course: _____ Year taken: 9___10___11___12___

   Name of course: _____ Year taken: 9___10___11___12___

   Name of course: _____ Year taken: 9___10___11___12___

2. Do you think more geography should be taught in high school?

   Yes _____ No _____

3. Has the geography you learned in junior high (or grammar school) ever helped you in understanding subjects you have studied in senior high school? Yes _____ No _____

4. Why do you like (or dislike) geography? List one or two reasons.

   _____

   _____

   _____

Part II

Indicate, by means of checks in appropriate columns, whether you agree with, disagree with, or are uncertain about each of the following statements.

		(a)	(d)	(?)
1.	Boston is the hub of the universe.	( )	( )	( )
2.	Regions of dry, rocky wastelands are not deserts.	( )	( )	( )
3.	Spanish is spoken by more people in Madrid than in any other city in the world.	( )	( )	( )
4.	Moscow is nearer to Miami, Florida than to Seattle, Washington.	( )	( )	( )
5.	Prevailing winds are strong winds.	( )	( )	( )
6.	The sun is more than a hundred times as large as the earth.	( )	( )	( )
7.	A cyclone is a tornado of large extent.	( )	( )	( )
8.	The American farmer has better opportunities to make a living than the Japanese farmer.	( )	( )	( )
9.	In the Temperate Zone the sun is never directly overhead.	( )	( )	( )
10.	In Boston we have more hours of daylight on June 21st than on August 21st.	( )	( )	( )
11.	In area France is larger than Texas.	( )	( )	( )
12.	It is always cold in the Frigid Zone.	( )	( )	( )
13.	El Paso, Texas is nearer to Texarkana, Texas than is Chicago, Illinois.	( )	( )	( )
14.	Airplanes leaving New York for Calcutta, India via the shortest route head either east or west.	( )	( )	( )
15.	There are occasional hail storms in the tropics.	( )	( )	( )
16.	The growing season north of the Arctic Circle is short.	( )	( )	( )
17.	Parallels of latitude are shown on most maps as vertical lines.	( )	( )	( )

		(a)	(d)	(?)
18.	The distance from any point on the Arctic Circle to the North Pole is less than one thousand miles.	( )	( )	( )
19.	Every place in the Torrid Zone is hot.	( )	( )	( )
20.	Mountain Everest is the highest mountain in the world.	( )	( )	( )
21.	Mountains are always higher than hills.	( )	( )	( )
22.	Cows are sacred throughout India.	( )	( )	( )
23.	The sun is nearer to the earth in July than in January.	( )	( )	( )
24.	New York City is more than 900 miles from Boston.	( )	( )	( )
25.	The Magnetic North Pole is less than fifty miles away from the geographic North Pole.	( )	( )	( )
26.	Abundance of food available for the picking may be found in any jungle.	( )	( )	( )
27.	In the Torrid Zone the sun is always directly overhead at noon.	( )	( )	( )
28.	Snow never falls in the Torrid Zone.	( )	( )	( )
29.	The water level in Lake Superior is usually the same as the water level in Lake Michigan.	( )	( )	( )
30.	If the world were cut into an eastern and western hemisphere, Europe, Asia, and Africa would fall entirely in the eastern hemisphere.	( )	( )	( )
31.	The moon is smaller than the sun.	( )	( )	( )
32.	The Arabians regard Jerusalem as a holy city.	( )	( )	( )
33.	The average January temperature in Juneau, Alaska is less than ten degrees Fahrenheit (10°F).	( )	( )	( )
34.	The area of Greenland is larger than the area of Arabia.	( )	( )	( )
35.	Siestas are common in South America because the people are lazy.	( )	( )	( )
36.	The Hindus regard the Ganges as a sacred river.	( )	( )	( )
37.	The population of Boston is greater than the population of the entire state of New Hampshire.	( )	( )	( )

		(a)	(d)	(?)
38.	If a pilot flies due south from Detroit, Michigan, the first foreign country he will fly over will be Canada.	( )	( )	( )
39.	Canada receives fewer total hours of sunlight during the year than Florida.	( )	( )	( )
40.	The average January temperature of Boston is more than twenty-five degrees Fahrenheit ($25^{\circ}F$).	( )	( )	( )
41.	Connecticut is the smallest state in the United States.	( )	( )	( )
42.	Rocks in fields sometimes increase in size from year to year.	( )	( )	( )
43.	A telegraph message sent from Boston, Mass. at 6 p.m. January 10 would arrive in Tokyo, Japan on January 9 (difference in date due to crossing of International Date Line).	( )	( )	( )
44.	Canada's population is a little over half that of the United States.	( )	( )	( )
45.	The newer world maps are more useful than the old because they have no distorted facts.	( )	( )	( )
46.	The best fishing grounds are usually found on a continental shelf.	( )	( )	( )
47.	The northern boundary of Maine is north of the northern boundary of Minnesota.	( )	( )	( )
48.	Tigers are found in Africa.	( )	( )	( )
49.	Latitude means the distance north or south of the equator.	( )	( )	( )
50.	More than 75% of the land of Aroostook County, Maine is devoted to raising potatoes.	( )	( )	( )
51.	In the Temperate Zone it is never as hot as in the Torrid.	( )	( )	( )
52.	France and Portugal have colonies in India.	( )	( )	( )
53.	The Niagara Falls are the biggest falls in the world.	( )	( )	( )
54.	All places in the Frigid Zone have a period of six month's darkness followed by a period of six month's daylight.	( )	( )	( )
55.	Africa is a country.	( )	( )	( )
56.	The continental shelf extends three miles from the shores of the United States.	( )	( )	( )

		(a)	(d)	(?)
57.	The mouth of the Mississippi is nearer the center of the earth than its source.	( )	( )	( )
58.	It never rains in the desert.	( )	( )	( )
59.	A river is usually wider at its mouth than at its source.	( )	( )	( )
60.	Miami, Florida has more hours of daylight in June than Boston.	( )	( )	( )
61.	Natural sponges are picked clean skeletons of animals.	( )	( )	( )
62.	The growing season in Buenos Aires, Argentina is longer than the growing season in Rio de Janeiro, Brazil.	( )	( )	( )
63.	Any straight line drawn on a gnomonic map is a great circle.	( )	( )	( )
64.	A very small fraction of the heat given off by the sun is received by the earth.	( )	( )	( )
65.	In the Temperate Zone it is sometimes as cold as in the Frigid.	( )	( )	( )
66.	Camphor trees grow in Formosa.	( )	( )	( )
67.	The tuna fish is a relatively large fish.	( )	( )	( )
68.	Most of the rivers of the world flow south.	( )	( )	( )
69.	Boston is a little farther north of the equator than is London.	( )	( )	( )
70.	Many minerals are found in rocks.	( )	( )	( )
71.	There is one national language in China understood and spoken by most of the people.	( )	( )	( )
72.	The area of Canada is larger than that of the United States.	( )	( )	( )
73.	Sugar beets are grown in Minnesota.	( )	( )	( )
74.	To measure the shortest distance between two points on the earth's surface specially constructed globes (not the kind found in most classrooms) must be used.	( )	( )	( )
75.	Earthquakes on the ocean floor may cause tidal waves.	( )	( )	( )
76.	It takes less than one second, by means of short-wave radio or underwater cable, for a person speaking in Boston, Mass. to be heard in Shanghai, China.	( )	( )	( )

		(a)	(d)	(?)
77.	St. Johns, Newfoundland is on the direct air route between New York and Rome.	( )	( )	( )
78.	The width of a river at any point may be easily found on any map.	( )	( )	( )
79.	All seas contain salt water.	( )	( )	( )
80.	New York is farther south than Boston.	( )	( )	( )
81.	Wild elephants live in the forests of Burma.	( )	( )	( )
82.	All the inhabitants of India other than the "Untouchables" are members of some caste.	( )	( )	( )
83.	The average January temperature of Rio de Janeiro, Brazil is 78°F.	( )	( )	( )
84.	At the North Pole the sun appears to rise in the east and sink in the west.	( )	( )	( )
85.	Magellan was the first man to sail around the southern part of South America.	( )	( )	( )
86.	Subway systems are more common in the United States than in Europe.	( )	( )	( )
87.	San Diego, California is west (not east) of Reno, Nevada.	( )	( )	( )
88.	Columbus was the first man to believe that the earth is round.	( )	( )	( )
89.	The farther south we go the warmer it gets.	( )	( )	( )
90.	Sharks are worthless to fishermen.	( )	( )	( )

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